

REMARKS/ARGUMENTS

Reconsideration of this application in light of the above amendments and following comments is courteously solicited.

The invention as claimed in amended claim 1 is directed to a copper alloy consisting essentially of 58 to 66 wt% of copper, 0.1 to 0.5 wt% of tin, 0.01 to 0.5 wt% of silicon, at least one of 0.3 to 3.5 wt% of lead and 0.3 to 3.0 wt% of bismuth, at least one of 0.02 to 0.15 wt% of phosphorus, 0.02 to 3.0 wt% of nickel and 0.02 to 0.6 wt% of iron, the total amount of phosphorus, nickel and iron being in the range of from 0.02 to 3.0 wt%, and the balance being zinc and unavoidable impurities, wherein a proportion of an alpha phase is 90 vol% or more. Such a copper alloy has an excellent corrosion cracking resistance and an excellent dezincing resistance while maintaining excellent characteristics of conventional brasses.

Thus, in the amended claim 1, the content of tin is 0.1 to 0.5 wt%, and the proportion of the alpha phase is 90 vol% or more.

Furthermore, the copper alloy in Example 1 has the same composition as that of the copper alloy in Comparative example 4, and the copper alloy in Example 6 has the same composition as that of the copper alloy in Comparative Example 5. In addition, the copper alloys in Example 1 and Comparative Example 4 have the proportions of the alpha phases of 83 vol% and 78 vol%, respectively, and the copper alloys in Examples 6 and Comparative Example 5 have the proportions of the alpha phases of 92 vol% and 84 vol%, respectively. Since the proportion of an alpha phase in the amended claim 1 is 90 vol% or more, the copper alloys in Example 1 and Comparative Examples 4 and 5 are not within the scope of the amended claim 1. That is, there are some cases where the dezincing resistance and stress corrosion cracking resistance are inferior as shown in Comparative

Examples 4 and 5 when the proportion of the alpha phase is less than 90 vol% due to inappropriate heat treatment conditions even if the copper alloy has the same composition, whereas the dezincing resistance and stress corrosion cracking resistance are excellent when the proportion of the alpha phase is 90 vol% or more.

Claims 1 and 5 were rejected under 35 U.S.C. §103 as being unpatentable over JP 60194035.

JP 60194035 discloses a copper alloy consisting essentially of 63.0 to 66.0% by weight of copper, 0.7 to 1.2% by weight of tin, 1.0 to 2.5% by weight of lead, 0.1 to 1.0% by weight of iron, 0.1 to 0.7% by weight of nickel, 0.01 to 0.1% by weight of antimony, 0.01 to 0.2% by weight of phosphorus, and the balance being zinc and unavoidable impurities, the alloy having alpha-phase structure.

JP 60194035 also discloses that the dezincing corrosion resistance of a copper alloy can be improved by tin and antimony. In addition, JP 60194035 discloses that, if a copper alloy has a tin content of 1.2 to 2.0 wt% which is a relatively high content, there are disadvantages in that a Cu₃Sn phase appears to cause embrittlement to easily cause cracking in a production process and it is difficult to stabilize the structure of the copper alloy due to the easily caused segregation of tin, so that irregularities in corrosion resistance of the copper alloy are easily caused since it is difficult to control the heat treatment process. That is, if a copper alloy contains a large amount of tin, there are the above-described disadvantages although it is possible to improve the dezincing corrosion resistance of the copper alloy.

JP 60194035 discloses a copper alloy consisting 63.58 wt% of copper, 1.30 wt% of lead, 0.34 wt% of iron, 1.33 wt% of tin, 0.08 wt% of nickel, and the balance of being zinc as test sample

4 in Table 1. The dezincing corrosion resistance of a copper alloy as test sample 4 is improved by adding a large amount of tin to the copper alloy. Therefore, there are the above-described disadvantages since the copper alloy contains a large amount of tin.

Furthermore, JP 60194035 discloses that the corrosion resistance of a copper alloy can be improved by adding antimony to the copper alloy (test samples 5, 6, 7) when the copper alloy contains 0.7 to 1.2 wt% of tin (test samples 2, 5, 6 and 7). That is, the corrosion resistance of the copper alloy disclosed in JP 60194035 can be improved by the synergistic effect of 0.7 to 1.2 wt% of tin and a small amount of antimony.

Thus, JP 60194035 fails to disclose or suggest any copper alloy consisting essentially of 58 to 66 wt% of copper, 0.1 to 0.5 wt% of tin, 0.01 to 0.5 wt% of silicon, at least one of 0.3 to 3.5 wt% of lead and 0.3 to 3.0 wt% of bismuth, at least one of 0.02 to 0.15 wt% of phosphorus, 0.02 to 3.0 wt% of nickel and 0.02 to 0.6 wt% of iron, the total amount of phosphorus, nickel and iron being in the range of from 0.02 to 3.0 wt%, and the balance being zinc and unavoidable impurities, wherein a proportion of an alpha phase is 90 vol% or more. JP 60194035 also fails to disclose or suggest that such a copper alloy has an excellent corrosion cracking resistance and an excellent dezincing resistance while maintaining excellent characteristics of conventional brasses.

In particular, JP 60194035 fails to disclose or suggest any copper alloy consisting 0.1 to 0.5 wt% of tin and having a proportion of alpha phase of 90 vol% or more, and also fails to disclose or suggest that the dezincing resistance and stress corrosion cracking resistance of a copper alloy containing 0.1 to 0.5 wt% of tin are excellent when the proportion of the alpha phase in the copper alloy is 90 vol% or more.

Accordingly, it is believed that the amended claims patentably distinguish the invention from the prior art.

An earnest and thorough attempt has been made by the undersigned to resolve the outstanding issues in this case and place same in condition for allowance. If the Examiner has any questions or feels that a telephone or personal interview would be helpful in resolving any outstanding issues which remain in this application after consideration of this amendment, the Examiner is courteously invited to telephone the undersigned and the same would be gratefully appreciated.

It is submitted that the claims as amended herein patentably define over the art relied on by the Examiner and early allowance of same is courteously solicited.

If any fees are required in connection with this case, it is respectfully requested that they be charged to Deposit Account No. 02-0184.

Respectfully submitted,

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